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## Mapping a Strong School Culture and Linking It to Sustainable School Improvement<sup>1</sup>

### Abstract

This article illuminates the key elements of a strong school culture that have been linked with sustainable school improvement. Policy literature and conversations highlight the importance of school culture as the softer strategy in school improvement. Within this context, this article reviews existing research literature to theorize the key elements of a “strong school culture.” Based on this, the article attempts to measure the key elements of a strong school culture and explores how those cultural elements are associated with sustainable school improvement, drawing from large survey data in the U.S. Implications for policy and research are discussed in depth.

**Keywords:** *Strong school culture; sustainable school improvement; professional learning community; academic press; student support; trust & respect; negativity*

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<sup>1</sup> An earlier version of this paper was presented at XXXX. (Omitted for Blind Review).

This article aims to illuminate the key elements of a strong school culture that have been linked with sustainable school improvement. Initial policy work related to rapid school improvement focused on solutions that involve pressure for accountability along with an emphasis on hiring and firing to bring staff skills into line quickly (Darling-Hammond & Berry, 1999). The policy conversations in many countries still emphasize “the problem” as one of qualifications and competence of staff, or of introducing new programs (Duke, 2004). At the same time, however, there is an increasing emphasis in the policy and practice “turnaround literature” on the importance of creating supportive school environments for teachers as well as students (Thapa, Cohen, Guffey & Higgens-D’Alessandro, 2013).

The policy literature rarely uses the phrase “school culture” which is probably due, in part, to the variability in the way it is conceptualized and used in research. Organizational culture is a slippery concept with attendant measurement issues, particularly when quantitative approaches are used (Jung, et al., 2009; Zamutto & Krakower, 1991). Malinowki (2009), in a recent review of instruments developed to examine school culture, found that few were fully developed and even fewer validated in multiple country contexts. However, other related terms, such as “collaborative environment” and “team leadership” are increasingly prominent in policy discussions, suggesting a willingness to examine the role of school culture as a softer strategy in sustainable school improvement.

Research that underpins this shift has often emphasized looking, one-at-a-time, for characteristics of school culture that were associated with student learning. A few, using the work of Hoy and his colleagues (Hoy, Tartar & Hoy, 2006; Wu, Hoy & Tartar, 2013) have developed composite models that have proven useful. In linking school culture to school

Lee, M. & Louis, K.S. (2019). Mapping a strong school culture and linking it to sustainable school improvement. *Teaching and Teacher Education*, 81, 84-96.

improvement, while there is a growing consensus that school culture is the integral part of school improvement (cf. Gruenert & Whitaker, 2015; Louis & Lee, 2016), an emerging body of literature on school culture has paid special attention to the *facilitating* role of school leaders (mostly principals) in bridging school culture and school improvement (e.g., Copland, 2003; Hollingworth et al., 2018; Leithwood & Jantzi, 1990). Research on the specific paths by which leaders help to sustain school improvement over time is less dense, but a few recent studies (Hollingworth et al., 2018; Palmer & Louis, 2017) report how principals forge and foster a positive school culture to support school improvement that endures, while Leithwood (2018) documents the challenges of sustaining improvements in school leaders' capacities to facilitate change.

Aside from the critical role of school leadership in lasting school improvement, however, what elements of a strong school culture are created and shared collectively by teachers and how a strong school culture plays out for *sustaining* improvement initiatives are empirically under-researched. Although the literature of teacher leadership touches on both school culture and school improvement, in a broader term, its foci have been put more on understanding the mechanism of teacher collaboration as a form of leadership (e.g., Harris, 2003; York-Barr & Duke, 2004), the role of teacher leadership in professional learning and development (e.g., Harris, 2003; Lin et al., in-press; Poekert, 2012), the relationship between teacher leadership and teacher agency (e.g., Charteris & Smardon, 2015; Priestley et al., 2015), and the impact of teacher leadership on student learning and/or engagement (e.g., Dove & Honigsfeld, 2010; Leithwood & Jantzi, 2000).

Reflecting the gaps we noted in leadership studies, it is appropriate to examine a larger group of competing measures of a stronger school culture to determine which may be the most critical *as levers for change*. Within this context, this article centers on two research questions:

- *What are the key elements of a strong school culture in conjunction with school improvement identified in existing studies?* This question extends the theorizing work that we have done in previous studies (e.g., Louis, 2006; Louis & Lee, 2016) by situating it in a compact view of the distinctive nature of schools as work settings.
- *What is the relationship between a strong school culture and sustainable school improvement as measured by student learning outcomes?* This question presents a test of the significance of culture for one of the critical objectives for schools as professional organizations: increasing student learning.

Using survey data gathered from 3,983 teachers in the U.S., this study aims to shed light on the conceptual and empirical links between a strong school culture and sustainable school improvement by answering the research questions. To this end, the article consists of four parts. In the next section, we detail our theorizing a strong school culture. We delineate the characteristics of the elements of a strong school culture closely related to school improvement that have been identified by previous research. Based on that, we propose possible relationships between a strong school culture and *sustainable* school improvement. Second, we describe the data and analytical approaches used in this study. Third, we present key results drawing from our analysis: 1) psychometric properties of measures for a strong school culture and 2) relationship between a strong school culture and sustainable school improvement. Finally, we offer

discussions and implications of the results for research and policy in terms of sustainable school improvement.

### **Theoretical Framework**

A persistent challenge facing schools globally is not the absence of school improvement initiatives, but their sustainability given that more often than not school improvement initiatives end in episodic, relatively short-lived or inconsistent (cf. Cheng, 2010; Masters, 2010) or fail to incorporate “reculturing” that entails deep change (Fullan, 2001). How can educators ensure the sustainability of school improvement? There is a relatively long line of research that connects school culture to the sustainability of improvement, beginning with Rosenholtz’s (1991) distinction between schools that were “stuck” and those that were “improving.” The theme of sustainability has been somewhat limited by the prevalence of cross-sectional study designs, but Hargreaves and Goodson (2006) emphasized, in their longitudinal study of declining schools, that culture was a key explanatory variable, while Harris (2006) noted that when schools focus on improvement with a weak school culture, they are unlikely to prosper. Many studies that look at culture and sustained improvement are qualitative studies of a few schools (e.g., Bellei, et al., 2016; Hipp, et al., 2008; Stringer, 2008) but a notable exception is Slegers, et al.’s (2014) longitudinal investigation of a large sample of Dutch elementary schools over four years. This work suggested that teachers’ individual capacities had the greatest impact on changes in their classrooms but that organizational conditions were particularly important in enhancing teacher’s motivations and learning.

By experience we also know that heroic teachers alone, as depicted in Hollywood films, cannot ensure sustainable school improvement (Toole & Louis, 2002), while Leithwood (2018) points to the need for persistence and collaboration both within the school and external partners in creating sustained change. It is reasonable to assume that schools with a strong positive culture where teachers collaboratively work together with collegiality, trust, and shared responsibility, school improvement would be more likely to continue as the outgrowth of a strong school culture. Indeed, a few previous studies have documented the linkage between teachers' professional interactions/relationships and sustainable school improvement (e.g., Coburn, et al., 2010; Orlina, 2010). This suggests that school improvement driven by teachers' professional interactions and networks would last longer than top-down and/or externally imposed innovations that often create teacher frustration (cf. Lee, 2018; Lin & Lee, 2018; Serbing & Bryk, 2000). Leithwood (2018) emphasizes that school cultures are critical, although long-term sustainability also requires attention to local community cultures as well as larger policy cultures.

Notably, the concept of professional learning communities (PLCs) within schools has been influential in explicating the role of teachers' collaborations and interactions in school improvement (cf. McLaughlin & Talbert, 2010; Stoll & Louis, 2007; Voelkel & Crispeels, 2017; Watson, 2014). Research on PLCs views professional interactions as an organizational mechanism that provides new ideas, critical feedback, and multiple perspectives for teachers through specific practices such as reflective dialogue (Ancess, 2003; Hord, 1997; Little, 2002; Louis et al., 2010; Watson, 2014). In this paper we situate PLCs as the "building blocks for school culture" (McLaughlin and Talbert, 2010, p. 35), and we explore the linkage between a strong school culture and sustainable school improvement. Specifically, we choose to explore

Lee, M. & Louis, K.S. (2019). Mapping a strong school culture and linking it to sustainable school improvement. *Teaching and Teacher Education*, 81, 84-96.

two underlying components (organizational learning and professional community) that have recently been combined into programs and initiatives to introduce PLCs. Notably, they have emerged from different research trajectories.

The first is the development of a culture of organizational learning, by which we mean the habits of searching for new information, processing that information with others, incorporating and evaluating new ideas, and of generating ideas within the school as well as importing them from outside (Brown & Duguid, 1991; Honig, 2008; Leithwood & Louis, 1998; Schechter, 2008; Schechter & Qadach, 2011). Organizational learning is important because it has been shown to be associated with student learning as well as effectiveness in other sectors (Marks, Louis, & Printy, 2002).

In recent years, research on organizational learning has been accompanied by an increasingly robust literature that focuses on teachers' professional cultures, often referred to as professional community (Louis, Marks & Kruse, 1996; McLaughlin & Talbert, 2010). In this study we conceptualize three dimensions of professional community. First, we note that while teachers need to feel responsible for the learning that occurs in their own classrooms, in a strong professional community they have a collective sense of contributing to the learning opportunities and outcomes of all students – beyond the current year and their currently assigned students. We conceptualize this line of practices as “shared responsibility.” Previous studies suggest that this construct is critical in predicting student learning (Lee, Louis, & Anderson, 2012). A second dimension is “deprivatization of practice” which involves the opening of classroom doors and the open sharing of classroom teaching practices through observation and subsequent discussion (Louis et al., 2010). This practice has been incorporated in the OECD's Teaching and Learning



International Survey, which suggests that it is a key component in a school-based PLC but occurs less often than other PLC dimensions in most countries (Lee & Kim, 2016). The third dimension is “reflective dialogue” that requires deeper discussions about “what works and what needs to change in classrooms in order to improve student learning” (Louis & Lee, 2016, p. 539), that go beyond simply sharing information over time with multiple colleagues (cf. Lin & Lee, 2018). OECD’s TALIS study also includes this dimension as a key part of school-based PLCs (Lee & Kim, 2016). We wish to highlight that these three dimensions of professional community, coupled with organizational learning, have been shown to be associated with various positive improvement outcomes both in the U.S. and other countries (Bolam et al., 2005; Lee, Walker, & Bryant, in press; Lomos, Hofman, & Bosker, 2011; Louis & Marks, 1998).

Aside from the current knowledge of the elements of PLCs, the empirical basis for determining what school cultures may be most effective is limited, with many competing frameworks in studies that typically examine only one feature of a school’s culture (or climate, depending on the author).<sup>2</sup> Several characteristics that have been shown to be related to student achievement in multiple studies are the subject of this inquiry.

First, we examine “academic press,” referring to the degree to which a school clearly gives priority to academic standards and creates a sense of importance among both staff and students around academic achievement (Kahne, Sporte, Torre, & Easton, 2008; Lee & Smith, 1999). Examinations of schools over long time periods suggest that this may be an important

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<sup>2</sup> This paper will sidestep the long-running argument about the distinction between climate and culture (Hoy, 1990) by asserting that culture typically refers to a quality of values, norms and behaviors in a school that is stable over time (Schein, 1992), while climate more typically refers to the tone or feeling of a setting that is more mutable (Gruenert & Whitaker, 2015). We realize that there will be disagreements about this more fundamental conceptualization but will focus on the implications of aspects of school settings that seem to make a difference and that can be fostered by leaders.

Lee, M. & Louis, K.S. (2019). Mapping a strong school culture and linking it to sustainable school improvement. *Teaching and Teacher Education*, 81, 84-96.

feature of “improving” schools (Mosenthal, Lipson, Torncello, Russ, & Mekkelsen, 2004).

Second, the school improvement literature has emphasized the need for both pressure and support over a long period and support for students has been shown to be reflected both in engagement and achievement. Coherent instructional programs work because they provide strong supports for students (Hallinger, Walker, & Lee, 2010; Newmann, Smith, Allensworth, & Bryk, 2001), and are related to achievement (Heck & Hallinger, 2009). Note that research demonstrating the link between student support and sustainable school improvement is rare.<sup>3</sup>

Third, a deep line of research has emerged about the importance of “trust and respect” among adults in schools in determining both improvement in school practices and student learning (Bryk & Schneider, 2002; Hoy, Tartar, & Witkoskie, 1992; Tschannen-Moran & Hoy, 1998). Recent studies further illuminate how trust and respect among school staff function as a moral or emotional resource for school improvement. Demerath’s (2018) case study shows that trust and respect serve as an important feedback loop, forging and mediating positive emotions that, in turn, shape school improvement culture. A recent Chilean study (Weinstein, Raczunski & Peña, 2018) elaborates the processes by which trust is developed and maintained among school professionals. At the same time, however, longitudinal research with a focus on the link between trust/respect and sustainability of school improvement is still thin.

Finally, where teachers feel racial or cultural tensions, where they have a negative attitude toward students, and where absenteeism is high, student achievement tends to be low. We call this “negativity.” This measure might be thought of as the opposite of academic

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<sup>3</sup> Note that the construct of “student support” in this study measures how and to what extent students are supported in school (see Appendix 1). In this regard, the construct is conceptually different from student voice or student participation that highlights the importance of student agency in (sustainable) school change and improvement (cf. Bergmark & Kostenius, 2009; Mitra, 2018).

Lee, M. & Louis, K.S. (2019). Mapping a strong school culture and linking it to sustainable school improvement. *Teaching and Teacher Education*, 81, 84-96.

optimism, which has also been shown to be related to student learning (Hoy, Tarter, & Hoy, 2006). There are three reasons why we include this negative aspect of school culture in our investigation. First, such negative features of school culture are more often than not identified in typical school settings. Second research suggests that such negative features of organizational culture may have disproportionate impacts on organizational outcomes (e.g., Louis & Lee, 2016), compared to positive aspects of organizational culture (e.g., Venkataramani, 2013). Third, the relationship between negativity and sustainability of school improvement is still under-researched.

## **Methods**

### **Data Sources**

This paper is a secondary analysis of data focusing on defining and measuring a strong school culture that is linked to sustainable school improvement as measured by changes in school-level student learning outcomes over three consecutive years. The larger study design involved a random sample of nine U.S. states, and a subsequent stratified (by district size, poverty, and diversity) random sample of four districts within those states. Within each of the sampled districts, a secondary school and an elementary school were selected to collect survey data from teachers in 2008. In total, teachers and principals in 182 schools were sampled. Within the sampled buildings, teachers were asked to fill out paper and pencil surveys. Scales to measure the variables described below were developed from a teacher survey questionnaire to measure their perceptions of the eight factors noted below. Teacher surveys were administered

during a faculty meeting.<sup>4</sup> Data about the school's achievement levels were obtained from public data sources (i.e., states' test scores for measuring Adequate Yearly Progress). The final analysis for this paper included 3,983 teachers from 133 schools; 49 out of the 182 schools where teachers did not sufficiently respond to the survey items used as key variables of the final analysis were excluded. As Table 1 shows, the characteristics of the sampled schools show significant variation in terms of size, levels of family poverty among the student body, and racial/ethnic diversity.

>>Insert Table 1 here<<

## Measures

The study included two broad categories of variables: school-culture related variables and school-level achievement measure. We define these below (see also Appendix 1 for detailed information about survey items).

*School-culture related variables.* School-culture related variables were comprised of 35 indicator variables representing different aspects of a school culture, which resulted in generating eight latent constructs through confirmatory factor analysis:

- **Organizational Learning:** This construct was built using 3 items ( $\alpha = .87$ ) such as “How many teachers in this school seek out and read current findings in education?” High values (i.e., on a 6-point scale where 6 is “strongly agree”) indicate a high level of organizational learning.

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<sup>4</sup> More details about the sampling and data collection procedures may be found elsewhere (Louis, et al., 2010, pp 301-18). The survey development is described in the same source. Surveys are available from the second author.

- **Shared Responsibility:** This construct was based on individual teacher responses on 4 items ( $\alpha = .85$ ) such as “How many teachers in this school take responsibility for improving the school outside their own class?” High values (i.e., on a 6-point scale where 6 is “all”) indicate a high level of shared responsibility.
- **Reflective Dialogue:** This included 4 items ( $\alpha = .83$ ) such as “How often in this school year have you had conversations with colleagues about what helps students learn best?” High values (i.e., on a 5-point scale where 5 is “10 times or more”) indicate that teachers interact with colleagues more frequently through dialogues and conversations related to student learning.
- **Deprivatized Practice:** This construct was measured by 4 items ( $\alpha = .80$ ) such as “How often in this school year have you visited other teachers' classrooms to observe instruction?” High values (i.e., on a 5-point scale where 5 is “10 times or more”) indicate that teachers have deprivatized practices more frequently such as visiting to colleagues' classrooms or inviting colleagues to their classrooms for enhancing their teaching practices.
- **Academic Press:** This latent construct was measured by 6 items ( $\alpha = .89$ ) such as “We have well defined learning expectations for all students.” High values (i.e., on a 6-point scale where 6 is “strongly agree”) indicate a high level of academic press.
- **Student Support:** This construct was based on 5 items ( $\alpha = .86$ ) such as “Resources are allocated to support students who have greater needs.” High values (i.e., on a 6-point scale where 6 is “strongly agree”) indicate a high level of student support.

- Trust and Respect: This construct was built using 6 items ( $\alpha = .93$ ) such as “Most of my colleagues can be relied upon to do as they say they will do.” High values (i.e., on a 6-point scale where 6 is “strongly agree”) indicate that a high level of trust and respect is embedded in teachers’ work life.
- Negativity: This measure was based on 3 items ( $\alpha = .68$ ) such as “Teachers at this school are absent habitually” and “There are race or cultural tensions at this school.” High values (on a 6-point scale where 6 is “strongly agree”) indicate that those negative incidents such as absenteeism and tensions among members are salient.

*School-level achievement.* To link school culture and student learning, we used school-level student achievement because individual student achievement data were not available from all states. This variable for group comparisons of school culture was based on aggregate student achievement of language arts proficiency, measured at two different time points (i.e., in 2005/6 and 2006/7).<sup>5</sup> We used school-level achievement test data to create three proportional school groups: Low, Medium, and High in order to investigate how the elements of a strong school culture are associated with the levels of school achievement (See the notes below Table 1 for details).<sup>6</sup> More importantly, to further explore the relationship between strong school culture and “sustainable” school improvement, we purposively subsampled schools that showed either continuous improvement or continuous decline in student learning outcomes over three consecutive years from 2005/6 to 2007/8. This supplementary analysis included 34 of the 133

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<sup>5</sup> The correlation coefficient of language arts proficiency between 2005/6 and 2006/7 was .940 ( $p < .01$ ).

<sup>6</sup> We acknowledge that standardized achievement tests are a limited measure of student learning and school performance. However, when considering sustainability, there are few data sources that allow an investigation of other important school outcomes.

schools. For a broader implication, we used both language arts proficiency and mathematics as school-level achievement.

### **Analytical Strategy**

To investigate the first research question (i.e., the link between a strong school culture and school-level achievement), it was critical to develop a psychometrically valid measure of a strong school culture. We thus introduce our approach and measurement results in detail. Data were analyzed using confirmatory factor analysis (CFA) and a follow-up investigation employing latent mean analysis, a form of structural equation modeling. Through CFA, we sought to test our proposed model measuring a strong school culture. Specifically, we examined the psychometric properties and construct validity of our proposed model. To this end, we investigated convergent validity, discriminant validity, and the overall model fit, together with reliability analysis. Based on this measurement model, we further investigated how latent constructs representing different aspects of a strong school culture are associated with school-level achievement by employing latent mean analysis in order to examine the first research question. Specifically, we compared the latent means of each construct by school achievement level (i.e., low, mid, and high). To this end, tests of configural, metric, scalar, and factor variance were first conducted.

Several key indices were used to assess model fit. These included chi-square test statistic, standardized root mean square residual (SRMR), root-mean-square-error of approximation (RMSEA), comparative fit index (CFI) and the Tucker-Lewis index (TLI). In particular, we

relied more on standard cutoff recommendations of SRMR, RMSEA, CFI, and TLI (Hu & Bentler, 1999) rather than chi-square statistic, which is sensitive to sample size (Bentler, 1990).

Before these main analyses, our initial analyses using descriptive statistics indicated that missing data ranged from 1.2% to 3.8% for each variable representing different aspects of school culture. Missing data were imputed using the expectation-maximization (EM) algorithm on the total sample. Our preliminary analyses also revealed that the normality assumption of the data was not met, as illustrated in Table 2 (see Curran, West, & Finch, 1996). To compensate, we utilized a bias-corrected approach to bootstrapping, which involved resampling and replacing the original dataset 1,000 times prior to CFA and latent mean analysis. Based on the bias-corrected bootstrap procedure (cf. Efron, 1987), we adjusted the parameter estimates, standard errors, and effect sizes.

To explore the second research question about the link between a strong school culture and sustainable school improvement, we conducted an additional analysis with the 34 schools that showed either continuous improvement or continuous decrease in student achievement over three consecutive years. We employed a MANOVA test instead of latent mean analysis because the invariance test for these subsamples, a pre-requisite for conducting latent mean analysis, was not met.

## **Results**

### **Descriptive Statistics**

Table 2 presents descriptive statistics of each survey item such as means, standard deviations, skewness, and kurtosis. This suggests that, on average, the sampled teachers



Lee, M. & Louis, K.S. (2019). Mapping a strong school culture and linking it to sustainable school improvement. *Teaching and Teacher Education*, 81, 84-96.

perceived relatively positive organizational cultures in terms of organizational learning, shared responsibility, reflective dialogue, academic press, student support, and trust/respect. Based on the descriptive statistics, an investigation on the normality of the dataset using critical ratios (C.R.) indicated that the data did not meet the normality assumption. As such, we used a bias-corrected bootstrapping to address this issue.

>>Insert Table 2 here<<

### **CFA Measurement Model: Defining and Measuring a Strong School Culture**

A confirmatory factor analysis measurement model, consisting of the eight constructs, was conducted. As illustrated in Figure 1, the construct of professional learning community, which was proposed as a second-order factor consisted of four sub-factors including organizational learning, shared responsibility, deprivatized practice, and reflective dialogue. This confirmed current empirical research (Walker et al., 2014) and theoretical considerations (Louis, 2006). To further validate our four-factor conceptual model, we tested a competing model, consisting of one second-order factor of professional community (i.e., shared responsibility, deprivatized practice, reflective dialogue) and one first-order factor of organizational learning. The alternative was based on research suggesting that organizational learning emerges as a consequence of professional community (Lin & Lee, 2018). Results

indicated that there was no significant difference between the proposed model and the alternative models.<sup>7</sup> As such, the proposed model was used for subsequent analyses.

>>Insert Figure 1 here<<

The CFA model indicated an acceptable overall model fit (see Hu & Bentler, 1999): CFI = .921, TLI = .914, RMSEA = .055, SRMR = .063, and  $\chi^2 = 7072.4$ ,  $df = 546$ . Based on this, we further investigated the psychometric properties and construct validity. We first checked the factor loadings of all the indicator variables. A majority of the indicator variables showed excellent factor loadings (i.e., higher than .70) or good (i.e., higher than .50) factor loadings (Tabachnick & Fidell, 2007). Although the factor loadings from the second-order factor of professional learning community to reflective dialogue (.425) and deprivatized practice (.352) were relatively lower than others, their coefficients for factor loadings were also statistically significant ( $p < .001$ ).<sup>8</sup>

Along with inspecting the factor loadings and their statistical significance, we further investigated the average variance extracted (AVE) of each construct to confirm convergent validity (Campbell & Fiske, 1959). Higher AVE values suggest that indicator variables are more representative of each construct.<sup>9</sup> Three constructs (i.e., student support, negativity, and deprivatized practice) show relatively lower AVE (i.e., lower than .05) while the other constructs

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<sup>7</sup> The proposed model indicated the following model fit: CFI = .921, TLI = .914, RMSEA = .055, SRMR = .063. The model fit of the alternative model was: CFI = .922, TLI = .914, RMSEA = .055, SRMR = .063. For more information about the model-testing work, contact the first author.

<sup>8</sup> These results are not tabled but are available from the first author.

<sup>9</sup> AVE is computed as follow:  $AVE = (\sum \text{square standardized loadings}) / [(\sum \text{square standardized loadings}) + (\sum \text{measurement error})]$ .

Lee, M. & Louis, K.S. (2019). Mapping a strong school culture and linking it to sustainable school improvement. *Teaching and Teacher Education*, 81, 84-96.

exceed 0.50, the conventional threshold value (Hair, Black, Babin, & Anderson, 2009). We conclude that convergent validity with respect to student support (.40) and deprivatized practice (.41) was partially obtained, but for negativity (.25), a concern remained.

We were left with a measurement question that has theoretical implications, namely whether the measured dimensions of school culture are genuinely distinctive. Thus, we investigated discriminant validity. Due to the presence of a few pairs of constructs having high correlations in our measurement model, we scrutinized whether those constructs having high correlations can be distinguishable. In relation to discriminant validity, our concern was mainly on one particular pair of latent constructs—i.e., academic press and student support, showing the highest correlation (.753) in our measurement model (see Table 3). Although the highest correlation coefficient was lower than a conventional threshold of .85, which signals poor discriminant validity or collinearity (Kenny, 2011), we wished to ensure the discriminant validity of the two constructs. Since there is no explicit way to check collinearity in CFA, we used several different approaches.

>>Insert Table 3 here<<

We first examined whether the AVE values of academic press and student support are greater than the square of their correlation (Netemeyer, Johnston, & Burton, 1990). The result indicated that each of their AVE values (i.e., .528 for academic press and .401 for student support) were not greater than the square of their correlation (.567). Consequently, we cross-checked this result with three other investigations.

First, we examined model fit by comparing a competing model which constrained the correlation of the two constructs to one with the proposed model (Kenny, 2011). The chi-square test indicated that the two models were significantly different ( $\Delta\chi^2 = 132$ ,  $df = 1$ ). That is, the model comparison indicated that discriminant validity exists between the two constructs. Given these mixed results, we compared the original model another competing model, which collapsed the two constructs and combine them into one construct (Kenny, 2011). The result indicated that the original model maintains better model fit CFI = .921, TLI = .914, RMSEA = .055, SRMR = .063) than the competing model (CFI = .890, TLI = .881, RMSEA = .067, SRMR = .065). This supported the presence of discriminant validity and psychometric distinctiveness of Academic Press and Student Support. Finally, we employed an additional complementary assessment using the correlation coefficient (.753) and standard error (.024) between the two constructs, using the comparative approach suggested by Anderson and Gerbing (1988). This final investigation suggested that discriminant validity exists between the two constructs. Considering the sum of these investigations, we concluded that there is discriminant validity between academic press and student support to warrant treating them as both theoretically and psychometrically distinct.

In summary, our investigation indicated that the proposed model achieved acceptable model fit. Also, the constructs in the model showed solid reliability and appeared to obtain discriminant validity and convergent validity whereas some constructs exhibited partial convergent validity.

### **Latent Mean Analysis: Linking a Strong School Culture to School-Level Achievement**

To further link a strong school culture and school-level achievement, measured by 2005/6 and 2006/7, we conducted latent mean analysis. Specifically, we compared teachers from low-performing schools (1,204 teachers) with their counterparts in mid- (1,242 teachers) and high-performing (1,274 teachers) schools.<sup>10</sup> A series of invariance tests of the CFA model (see Figure 1) with bootstrapping was conducted.<sup>11</sup> Based on the invariance tests, the latent mean model with bootstrapping indicated an acceptable model fit:  $\chi^2(1758) = 8627.9$ , CFI = .910, TLI = .908, RMSEA = .032 and SRMR = .069.

The latent mean model showed that teachers in low-performing schools (i.e., the reference group) perceived weaker school cultures than their counterparts in mid- and high-performing schools, as presented in Tables 4 and 5. Specifically, compared to teachers in low-performing schools, their counterparts in mid-performing schools turned out to perceive significantly stronger school cultures in terms of professional learning community (.197\*\*\*), academic press (.318\*\*\*), student support (.345\*\*\*), and trust/respect (.286\*\*\*). Conversely, teachers in mid-performing schools perceived significantly lower levels of school cultures in terms of negativity (-.468\*\*\*). The effect sizes (Cohen's *d*) further reinforced this conclusion of significantly stronger cultures among teachers in mid-performing schools than teachers in low-performing schools: professional community (.305), academic press (.376), student achievement (.375), trust/respect (.305), and negativity (-.332).

The same pattern was identified in the comparison between low- and high-performing schools. Compared to teachers in low-performing schools (reference group), their counterparts in

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<sup>10</sup> Due to missing values of academic achievement of a few schools, the number of teachers in the latent mean analysis was slightly reduced (i.e., from 3,983 to 3,720).

<sup>11</sup> We compared the values of  $\Delta$ TLI,  $\Delta$ RMSEA,  $\Delta$ SRMR, and  $\Delta$ CFI for invariance tests rather than using  $\Delta\chi^2$  given its statistical stringency regardless of the nature of data such as sample sizes.

Lee, M. & Louis, K.S. (2019). Mapping a strong school culture and linking it to sustainable school improvement. *Teaching and Teacher Education*, 81, 84-96.

high-performing schools perceived significantly stronger school cultures. At the same time, the effect sizes further informed us that the differences in teachers' perceptions of school cultures between low- and high-performing schools were wider than the discrepancies between low- and mid-performing schools (see Table 5).

All these results indicate that there were significantly positive associations between the latent means of school culture constructs and the levels of school performance.

>>Insert Table 4 here<<

>>Insert Table 5 here<<

### **MANOVA: Linking a Strong School Culture to Sustainable School Improvement**

We categorized the 34 continuously declining/continuously improving schools into two additional groups using an additional categorization (high-performing vs. low-performing schools) –i.e., four groups in total (see Table 6) based on school-level achievement for the three consecutive years from 2005/6 to 2007/8. As an example, School 3 is a high performing school with a continuous increase in school-level achievement (High Performing School with Sustainable Improvement), while School 8 is a high performing school but shows a continuous decline in achievement (High Performing School without Improvement).

>>Insert Table 6 here<<

Next, we conducted a MANOVA test with the 34 schools instead of latent mean analysis, as the invariance test was not met.<sup>12</sup> Before reporting the MANOVA results, we briefly summarize the descriptive statistics here (see also Appendix 2 for details). On average, high-performing schools with sustainable improvement showed the highest levels in most dimensions of strong school culture (e.g., PLC, academic press, trust & press) than the other types of schools. Also, high-performing schools with sustainable improvement showed the lowest level in the negative school culture (i.e., Negativity) than the other schools. Conversely, on average, lowest-performing schools without improvement showed the lowest levels in all the cultural components. At the same time, however, the cases of low performing schools with sustainable improvement showed similarly positive features of those school cultural dimensions to those of high-performing schools. The MANOVA results in Table 7 confirmed that there were significant group differences in the cultural elements by the type of schools.

>>Insert Table 7 here<<

Post-hoc tests further confirmed the patterns of the descriptive statistics described above.<sup>13</sup> At the same time, the post-hoc test also suggests that there was no statistical difference between low-performing schools with sustainable improvement and the other two groups of high-performing schools in the domain of PLC, Academic Press and Student Support. Statistically, low-performing schools with sustainable improvement lagged only behind the high-

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<sup>12</sup> We tested the same CFA measurement model with the subsamples. The model fit was good (e.g., CFI = 910; RMSEA = .057) with Chi-square = 2382.98, *df* = 546. This means that the latent constructs of strong school culture were also clearly identified with teachers in the subsampled schools.

<sup>13</sup> These results are not tabled but are available from the first author.

Lee, M. & Louis, K.S. (2019). Mapping a strong school culture and linking it to sustainable school improvement. *Teaching and Teacher Education*, 81, 84-96.

performing schools in Trust & Respect and Negativity. A visual depiction of the results, shown in Appendix 2, is, perhaps, the most compelling reminder that strong cultures can propel improvement even in schools that start with low achievement, thus linking school culture with early sustainability.

## **Limitations**

Before our discussion on the results, we acknowledge that there are several methodological and theoretical limitations in this study. First, although our proposed model showed solid reliability, all significant factor loadings, and discriminant validity, the partial convergent validity of some constructs (Student Support, Negativity and Deprivatized Practice) suggests that further investigations are needed. Second, further qualitative and quantitative investigations of the school culture constructs are necessary to understand the dynamics and interactions of culture, improvement, and sustainability. Third, a longitudinal analysis that includes school culture variables as well as student outcomes would be desirable to capture which aspects of school culture most influence school performance, as would studies that include individual student outcomes.

## **Discussion**

What are the key elements of a strong school culture in conjunction with school improvement, which are identified in existing studies? In this study, we identified academic press, student support, trust & respect, low negativity (or optimism as the opposite of negativity), professional learning community (consisting of shared responsibility, reflective dialogue, deprivatized practice, and organizational learning). More importantly, results suggest that *schools strongly*



*equipped with those cultural elements showed higher levels of school performance than that of their counterparts*; there were significantly positive associations between school culture constructs and the levels of school performance. While the results are understandable intuitively, given the positive organizational features embedded in those cultural elements, the results can be further understood by looking closely at emerging research literature.

First, our work affirms the earlier efforts of Hoy and his colleagues to develop measures of school culture that are not uni-dimensional. We have, we believe, added significantly to this effort by incorporating additional measures of school culture that have frequently been associated with student achievement, particularly those that are associated with the robust scholarship on Professional Community/Professional Learning Communities. Specifically, in the literature of PLC, educators are characterized as knowledge workers who pursue collective learning (Organizational Learning), which is promoted when they clearly give priority to student learning and academic standards (Academic Press). To this end, teachers in the context of PLC are also expected to share their responsibility for student learning – i.e., Shared Responsibility – to which their opening classroom activities (Deprivatized Practice) and day-to-day dialogues reflecting their instruction (Reflective Dialogue) are instrumental. It is reasonable to expect that this kind of collaborative culture may reduce difficult and/or uncertain work as emotional labor (Low Negativity), which is sometimes inevitable from teachers' professional lives, and can gradually shape mutual respect and trust among colleagues (Trust & Respect). All this professional context can form a norm that students as vulnerable long-term members should be supported by adult members in school (Student Support). Theorizing school culture is a daunting task. However, we believe that the results from our analysis combined with the emerging

literature can be a platform to add momentum to theorizing school culture as a multi-dimensional construct.

Our second research question is: What is the relationship between a strong school culture and sustainable school improvement as measured by student learning outcomes? There were significantly positive associations between the cultural elements of school and the levels of school performance. More importantly, our analysis further suggests that there was a clear linkage between schools with a strong culture and their *continuous improvement* in school-level achievement. That is, the cultural elements are critical to sustainable school improvement, measured by academic achievement. *Even low-performing schools appeared to be able to sustain the improvement of academic achievement, especially when they were strongly equipped with those cultural elements. This suggests that the effect of school culture on school performance is not short-lived. It can be an enduring effect that counters organizational inertia.* This finding reflects Rosenholz's (1969) and Timperly and Robinson's (2001) investigations, which suggest that teachers' cultural assumptions either propel a school toward continuous improvement or hold it back.

Although our research questions did not focus on measurement, we cannot ignore the significance of our investigation for the measurement of school culture. While the psychometric properties of our constructs and the model are relatively strong, a few important issues remain. First, we wish to note that the average score of teachers' perceptions of deprivatized practices in their schools was relatively low which likely accounts for the insignificant group differences in deprivatized practices between our improving and stuck schools. Further efforts to improve our understanding and measurement of deprivatized practice seem advisable. The weak convergent

validity of the construct of negativity suggests a need to pay more attention to how best to conceptualize and measure underlying or more passive indicators of a non-nurturing culture that result in absenteeism and racial/ethnic or other tensions.

We wish to reassert that studies conducted in different countries and regions, which have also employed the same constructs of a strong school culture, have been validated. Specifically, the cultural elements such as PLC measured by the same or similar survey question items have been validated in several Asian countries (Ho, Lee, & Tang, 2016; Lee & Louis, 2018; Lee, Walker & Bryant, in -press; Lin, Lee, & Riordan, in-press) as well as the Netherlands (Lomos, Hofman & Bosker, 2011). In this regard, this study can pave a way to measure a strong culture that is positively linked to sustainable school improvement not only in the U.S. but elsewhere.

Our findings have significance beyond measurement and the advancement of a consistent theoretical framework for capturing school culture. In particular, school culture as it is experienced by adult professionals is largely ignored in today's policy conversations in spite of the accumulating evidence from multiple studies and countries that it is associated with student learning. There have been a lot of policy interventions or programs with a focus on teachers, school leaders, and/or "comprehensive/core" curriculum to sustain school improvement, and increasing attention given to improvement science, evidence-based practice, and data use. But policy has not addressed the underlying conditions that create improvement in some schools and decline or stasis in others. Arguably, implementing innovative ideas for teachers, leaders, and curriculum into practice is a far more complex process than we expect, because it is not a simple one-off event of *restructuring* schools but a complex, day-to-day process of *reculturing* schools (cf. Fullan, 2001). In other words, while such a focus on teachers, leaders, and curriculum is, in-

Lee, M. & Louis, K.S. (2019). Mapping a strong school culture and linking it to sustainable school improvement. *Teaching and Teacher Education*, 81, 84-96.

and-of-itself, legitimate, a missing-link in the emphasis is a strong school culture. We note, of course, that the variables that we include do not fully capture all of the elements that may be critical elements of a school's culture and point, for example, to collective efficacy (Goddard, Goddard, Sook Kim & Miller, 2015; Schechter & Qadach, 2011) and collective ethical beliefs (Starrett, 2005, Voelkel & Crispeels, 2017).

*We argue, in addition, that there is a need to shift the policy conversations toward understanding that a “strong culture” can be critical for sustainable school improvement.* We believe that the proven linkages between the cultural elements of school and the continuous improvement of school performance found by this study can serve as a good starting point for the shift of the policy conversations on sustainable school change. Of course, we still do not have a fuller picture about how and why school culture works. As examples, we need to deepen our understanding about 1) why the key elements of a strong culture identified in the study vary across schools, 2) why and how certain cultural elements work differently in different schools, and 3) whether similar dimensions of a strong school culture exist in geographically various jurisdictions. In this regard, future studies can benefit from our approaches (e.g., identified elements of a strong school culture, validated survey instrument with large scale data).

Aside from the possible benefit for future studies on school culture, at the same time, we wish to note that educators and policy makers should be cautious as to whether it is worth incorporating quantified metrics of school culture into the current accountability system used for evaluating school performance and improvement. In particular, there are increasing concerns that formalized PLCs may undermine teacher professionalism where they are disconnected from teacher initiated learning (Louis et al., 2010; Philpott & Oates, 2017). Although using

Lee, M. & Louis, K.S. (2019). Mapping a strong school culture and linking it to sustainable school improvement. *Teaching and Teacher Education*, 81, 84-96.

measurement of school culture as an input into the accountability system might be regarded as a logical future step given the array of increasing accountability metrics facing schools and teachers, we speculate that adding school culture into accountability metrics would be likely to end up trivializing its complexity. In conclusion, we believe that there is a need to shift the policy conversations toward understanding how a strong culture plays out for sustainable school improvement but also the need for intellectual discussions and empirical explorations on problems, paradoxes, and possibilities of school culture before moving into systemic policy conversations.

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Table 1  
*Sample teachers by school characteristics<sup>a</sup>*

	Frequency	%
Building Level		
Elementary	1429	36.7
Middle	1222	31.4
High	1242	31.9
School Poverty <sup>b</sup>		
Low	783	20.1
Medium	2296	59.0
High	799	20.5
School Diversity <sup>c</sup>		
Low	1287	33.1
Medium	1747	44.9
High	826	21.2
School Size <sup>d</sup>		
Small	720	19.4
Mid	2305	62.0
Large	695	18.7
District Size <sup>e</sup>		
Small	756	20.3
Medium	1744	46.9
Large	1219	32.8
School Performance <sup>f</sup>		
Low	1204	32.4
Mid	1242	33.4
High	1274	34.2

*Notes*

<sup>a</sup> The figures in this table are based on the data before imputation (N = 3893 teachers from 133 schools).

<sup>b</sup> School poverty is based on % of students participating in free/reduced lunch service (Low = 0%-17%, Medium = 18%-65%, High = 66%+).

<sup>c</sup> Diversity is based on % of White students (Low = 66%+, Medium = 185-65%, High = 0%-17%).

<sup>d</sup> A size of 400 was regarded as an upward limit of defining small schools (Cotton, 2001; Lee & Friedrich, 2007) and a size of 1500 students and above was grouped as a large schools (Lee, Ready, & Welner, 2002).

<sup>e</sup> District size was grouped as small (600-2499 students), medium (2500-24999 students), and large (25000 and above) (Louis et al., 2010).

<sup>f</sup> Based on the average school performance in language arts proficiency from 2006 and 2007, schools were categorized into three groups—i.e., low (mean score, 39.8 on a scale of 0 to 100), mid (mean score, 71.9), and high (mean score, 89.3) performing schools.

Table 2  
*Descriptive statistics of variables*

<i>Construct</i>	<i>Mean</i>	<i>S.D.</i>	<i>Skewness</i>	<i>C.R.</i>	<i>Kurtosis</i>	<i>C.R.</i>
Organizational Learning	4.50	1.04	-0.52	-13.35	-0.17	-2.15
	3.75	1.22	-0.03	-0.79	-0.87	-11.13
	3.85	1.16	-0.10	-2.53	-0.75	-9.55
Shared Responsibility	4.48	1.28	-0.56	-14.22	-0.64	-8.15
	4.21	1.19	-0.37	-9.37	-0.64	-8.17
	3.99	1.12	-0.22	-5.48	-0.65	-8.26
	4.10	1.15	-0.35	-8.86	-0.59	-7.46
Reflective Dialogue	4.10	1.00	-0.92	-23.45	0.11	1.42
	3.61	1.23	-0.46	-11.65	-0.85	-10.80
	3.96	1.11	-0.79	-20.19	-0.30	-3.79
	4.19	1.05	-1.12	-28.56	0.34	4.27
Deprivatized Practice	2.27	1.24	0.83	21.04	-0.28	-3.51
	2.66	1.23	0.40	10.06	-0.73	-9.31
	2.41	1.23	0.66	16.87	-0.45	-5.73
	2.34	1.28	0.71	18.19	-0.54	-6.82
Academic Press	5.06	1.11	-1.58	-40.15	2.54	32.33
	4.95	1.12	-1.42	-36.16	2.14	27.24
	5.09	1.05	-1.53	-38.87	2.65	33.73
	5.03	1.15	-1.46	-37.30	2.09	26.64
	5.14	1.10	-1.64	-41.82	2.83	36.07
	4.87	1.23	-1.28	-32.55	1.31	16.63
Student Support	4.37	1.46	-0.77	-19.68	-0.29	-3.75
	4.51	1.34	-0.92	-23.34	0.23	2.92
	4.37	1.43	-0.77	-19.60	-0.30	-3.82
	4.45	1.37	-0.84	-21.30	-0.08	-0.97
	4.59	1.28	-0.94	-23.90	0.43	5.45
Trust and Respect	5.04	1.12	-1.44	-36.77	2.08	26.45

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	5.05	1.06	-1.46	-37.17	2.43	30.93
	5.20	1.06	-1.73	-44.04	3.35	42.60
	5.00	1.06	-1.42	-36.21	2.34	29.77
	5.11	1.00	-1.44	-36.78	2.59	33.01
	4.69	1.17	-1.11	-28.14	1.03	13.07
Negativity	3.31	1.60	0.07	1.71	-1.17	-14.94
	2.40	1.44	0.82	20.97	-0.33	-4.24
	2.62	1.51	0.58	14.87	-0.78	-9.99

*Note:* N = 3983 teachers (from the imputed data). The non-normality of the data was detected through critical ratios (C.R. in the table). See Appendix 2 for details about each survey item.

Table 3  
*Correlation Matrix among Latent Constructs*

			Estimate
Academic Press	<-->	Negativity	-.391***
Academic Press	<-->	Trust & Respect	.552***
Academic Press	<-->	Student Support	.753***
Trust & Respect	<-->	Negativity	-.403***
Student Support	<-->	Trust & Respect	.649***
Student Support	<-->	Negativity	-.459***
Professional Learning Community	<-->	Student Support	.639***
Professional Learning Community	<-->	Negativity	-.346***
Professional Learning Community	<-->	Academic Press	.530***
Professional Learning Community	<-->	Trust & Respect	.690***

*Notes:* N = 3,983 teachers (from the imputed data). \*\*\* $p < .001$

Table 4  
*Latent Mean Comparison of A Strong School Cultures: Low-Performing vs. Mid-Performing Schools*

<i>School Cultures</i>	<i>Latent Mean<sup>a</sup></i>	<i>SE<sup>a</sup></i>	<i>Effect Size<sup>c</sup></i>
Professional Learning Community	0.197***	0.034	0.305
Academic Press	0.318***	0.041	0.376
Student Support	0.345***	0.043	0.375
Trust and Respect	0.286***	0.04	0.305
Negativity	-0.468***	0.054	-0.332

Notes. N = 3720 teachers (from the imputed data). \*\*\* $p < .001$

<sup>a</sup>The bias in mean estimates and standard errors was corrected through bootstrapping.

<sup>c</sup>Effect sizes were calculated using bias corrected estimates and common variances of latent constructs.

Table 5  
*Latent Mean Comparison of A Strong School Cultures: Low-Performing vs. High-Performing Schools*

<i>School Cultures</i>	<i>Latent Mean<sup>a</sup></i>	<i>SE<sup>b</sup></i>	<i>Effect Size<sup>c</sup></i>
Professional Learning Community	0.332***	0.034	0.515
Academic Press	0.528***	0.041	0.624
Student Support	0.560***	0.041	0.609
Trust and Respect	0.442***	0.039	0.471
Negativity	-0.734***	0.055	-0.521

*Note.* N = 3720 teachers (from the imputed data). \*\*\* $p < .001$

<sup>a</sup>The bias in mean estimates and standard errors was corrected through bootstrapping.

<sup>c</sup>Effect sizes were calculated using bias corrected estimates and common variances of latent constructs.

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Table 6

*Four Groups of Schools by Change in School-Level Achievement*

	Continuous Decline	Continuous Improvement
High Performing Schools	Schools 8, 19, 22, 30, 33	Schools 3, 4, 6, 9, 14, 17, 18, 21, 25, 26, 27, 31, 34, 37
Low Performing Schools	Schools 16, 39	Schools 2, 7, 10, 11, 12, 15, 20, 24, 28, 32, 35, 36

*Notes:* We excluded the following six schools (Schools 1, 5, 13, 23, 38, 40) from our MANOVA analysis because their overall level of school achievement for the three years was placed in middle-performing groups (second or third quartile in the achievement scale). For MANOVA, we needed to have a manageable number of grouping categories.

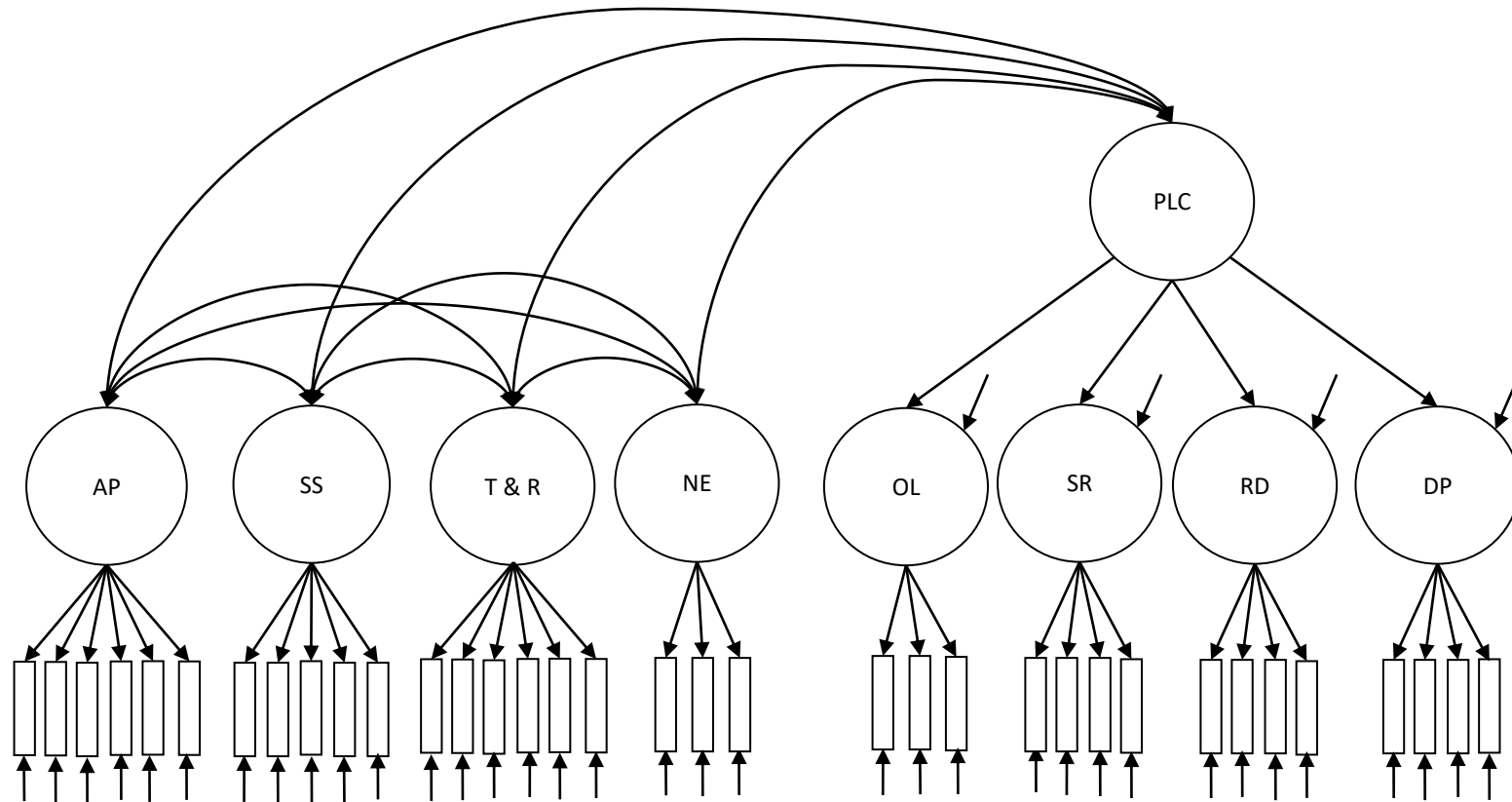


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Table 7  
*MANOVA Test Results*

Multivariate Tests						
Effect		Value	F	Hypothesis df	Error df	Sig.
Intercept	Pillai's Trace	.979	8079.09	5.000	866.000	.000
	Wilks' Lambda	.021	8079.09	5.000	866.000	.000
	Hotelling's Trace	46.646	8079.09	5.000	866.000	.000
	Roy's Largest Root	46.646	8079.09	5.000	866.000	.000
School Types	Pillai's Trace	.143	8.68	15.000	2604.000	.000
	Wilks' Lambda	.860	8.94	15.000	2391.046	.000
	Hotelling's Trace	.159	9.18	15.000	2594.000	.000
	Roy's Largest Root	.135	23.42	5.000	868.000	.000

*Note: N = 874*



Notes: All estimates above are statistically significant at the  $p < .001$  level. Error terms are omitted for simplicity.

AP = Academic Press, SS = Student Support, T & R = Trust & Respect, NE = Negativity, PLC = Professional Learning Community, SR = Shared Responsibility, RD = Reflective Dialogue, DP = Deprivatized Practice, OL = Organizational Learning.

*Figure 1. CFA Measurement Model*

Appendix 1. Scaled Items for Analysis

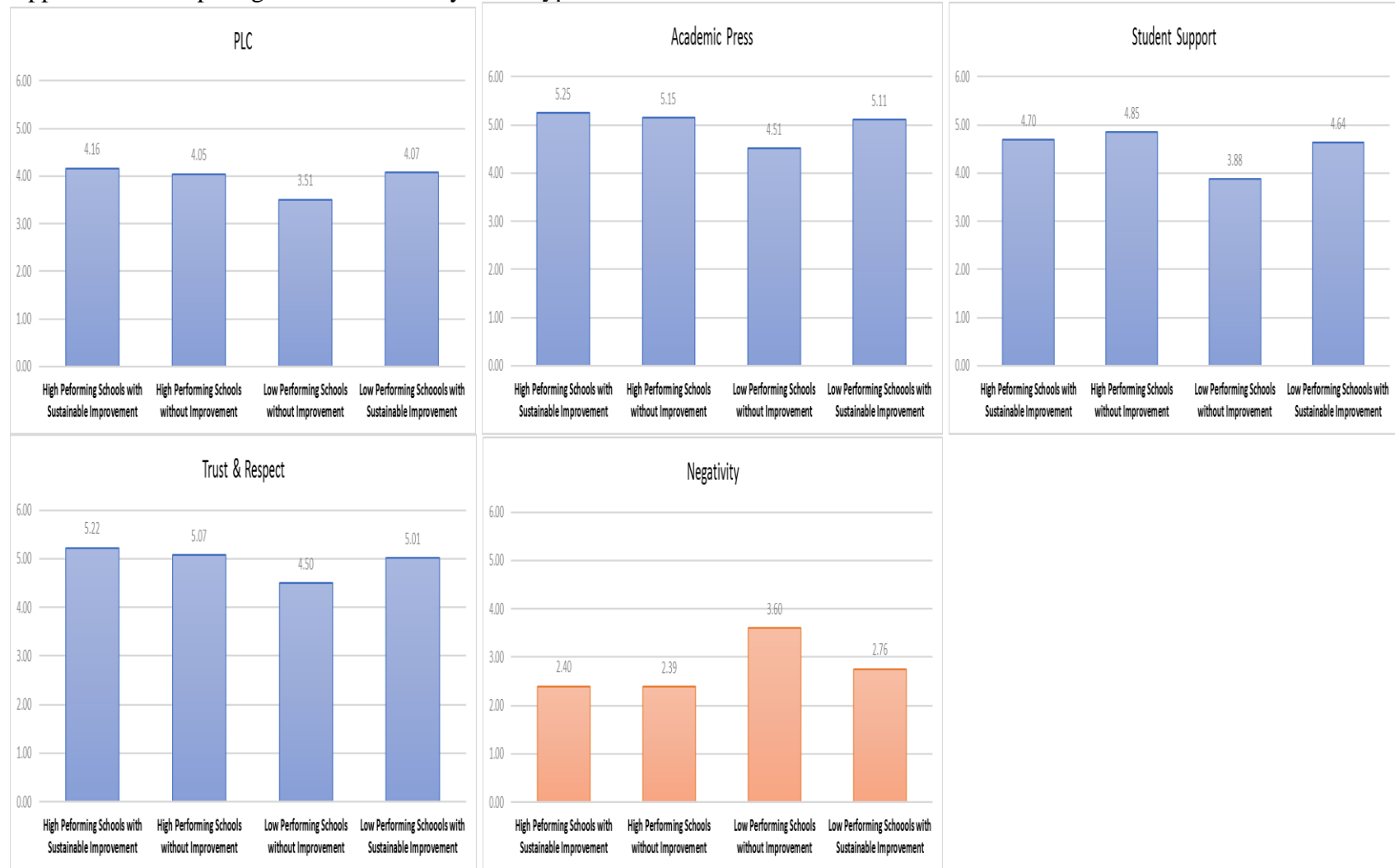
<i>Construct</i>	<i>Survey Question</i>	<i><math>\alpha</math></i>
Organizational Learning	How many teachers in this school show initiative to identify and solve problems?	0.87
	How many teachers in this school share current findings in education with colleagues?	
	How many teachers in this school seek out and read current findings in education?	
Shared Responsibility	How many teachers in this school meet with other teachers to collaboratively plan?	0.85
	How many teachers in this school help maintain discipline in the entire school, not just their classroom?	
	How many teachers in this school take responsibility for improving the school outside their own class?	
	How many teachers in this school feel responsible to help each other improve their instruction?	
Reflective Dialogue	How often in this school year have you had conversations with colleagues about what helps students learn best?	0.83
	How often in this school year have you had conversations with colleagues about development of new curriculum?	
	How often in this school year have you had conversations with colleagues about the goals of this school?	
	How often in this school year have you exchanged suggestions for curriculum materials with colleagues?	
Deprivatized Practice	How often in this school year have you visited other teachers' classrooms to observe instruction?	0.80
	How often in this school year have you received meaningful feedback on your performance from colleagues?	
	How often in this school year have you had colleagues observe your classroom?	
	How often in this school year have you invited someone in to help teacher you class(es)?	
Academic Press	We have well defined learning expectations for all students.	0.89
	Our student assessment practices reflect our curriculum standards.	
	Our school's curriculum is clearly aligned with learning goals.	
	Our school has multiple ways of assessing student learning other than state tests.	
	Academic achievement is recognized and acknowledged by the school.	
	The school sets high standards for academic performance.	
Student Support	Students have equal opportunities to be assigned to the best teachers.	0.86
	Resources are allocated to support students who have greater needs.	
	All students receive the same quality of instruction.	
	Struggling students get the attention they need in this school.	

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	In our school, problems are viewed as issues to be solved, not as barriers to action.	
Trust and Respect	Even in a difficult situation, teachers in this school can depend upon each other.	0.93
	Most of my colleagues can be relied upon to do as they say they will do.	
	I can trust the people I work with to lend me a hand if I need it.	
	Teachers in this school respect the professional competence of their colleagues.	
	Teachers in this school help and support each other.	
	Most teachers in our school share a similar set of values, beliefs, and attitudes related to teaching and learning.	
Negativity	Students at this school are absent habitually.	0.68
	Teachers at this school are absent habitually.	
	There are race or cultural tensions at this school.	

*Note:* N = 3983 teachers (from the imputed data). The Cronbach alpha of professional learning community (15 items from organizational learning, shared responsibility, reflective dialogue, and deprivatized practice) was .884.

## Appendix 2. Comparing School Culture by Four Types of Schools



*Note:* High Performing School with Sustainable Improvement (n = 411 teachers), High Performing School without Improvement (n = 79 teachers), Low Performing School without Improvement (n = 68 teachers), Low Performing School with Sustainable Improvement (n = 316 teachers). The variable of derivatized practice was converted from 5-points Likert scale to a 6-points Likert scale for this comparison.